SAN FRANCISCO BAY AREA

REDESIGNATION REQUEST AND MAINTENANCE PLAN (MAINTENANCE PLAN)

FOR THE NATIONAL OZONE STANDARD

AUGUST 1993

Mailing Address:
Planning Division
BAAQMD
939 Ellis Street
San Francisco, CA
94109
Fax
(415) 928-8560

Association of Bay Area Governments
510/464-7900

Bay Area Air Quality Management District
415/771-6000

MTC METROPOLITAN TRANSPORTATION COMMISSION
Metropolitan Transportation Commission
510/464-7700

TABLE OF CONTENTS

The Appendices referenced herein are not included with this document. They are included in a separate document, "Maintenance Plan Appendices", which can be obtained by calling the Bay Area Air Quality Management District, (415) 749-4900.

ABBREVIATIONS AND TERMINOLOGY

ABAG	Association of Bay Area Governements
AIRS	Air Information Retrieval System
APCO	Air Pollution Control Officer
ARB	(California) Air Resources Board
AQP	(1982 Bay Area) Air Quality Plan
BAAQMD	Bay Area Air Quality Management District
BAR	Bureau of Automotive Repair
CAA	(Federal) Clean Air Act
CAAA	(Federal) Clean Air Act Ammendments
CAP	(Bay Area 1991) Clean Air Plan
CEQA	California Environmental Quality Act
CFR	Code of Federal Regulations
CO	Carbon monoxide
DOT	Department of Transportation
EIR	Environmental Impact Report
EITAC	Emission Inventory Technical Advisory Committee
EKMA	Empirical Kinetic Modeling Approach
EPA	Environmental Protection Agency
FHWA	Feeral Highway Administration
FIP	Federal Implementation Plan
FMVCP	Federal Motor Vehicle Control Program
FTA	Federal Transit Administration
HC	Hydrocarbons
HOV	High Occupancy Vehicle
HPMS	Highway Performance Monitoring System
I & M	Inspection and Maintenance program
LDT	Light-duty Trucks
MTC	Metropolitan Transportation Commission
NAAQS	National Ambient Air Quality Standards
NMOC	Non-methane organic compounds
NO_x	Oxides of nitrogen
NO_2	Nitrogen Dioxide
NPRM	Notice of Proposed Rule Making
NSR	New Source Review
O_3	Ozone
PC-BEIS	Personal Computer - Biogenic Inventory System
PM_{10}	Particulate matter less than 10 microns
pphm	Parts per hundred million
ppm	Parts per million
PST	Pacific Standard Time
RACT	Reasonably Available Control Technology
RFP	Reasonable Further Progress
ROG	Reactive organic gases
RTP	Regional Transportation Plan
RVP	Reid Vapor Pressure
SIP	State Implementation Plan
SLAMS	State and Local Air Monitoring Stations
TCMs	Transportation control measures
TIP	Transportation Improvement Program
TPD	Tons per day
TSM	Transportation Systems Management
UAM	Urban Airshed Model
VMT	Vehicle miles travelled
VOC	Volatile organic compounds
WOCSS	Winds on Critical Streamline Surfaces

LIST OF TABLES AND FIGURES

TABLES

FIGURES

SECTION 1: INTRODUCTION

This is a Redesignation Request and Maintenance Plan (herein the "Maintenance Plan") to document and ensure continuing attainment of the national ambient air quality standard for ozone in the San Francisco Bay Area. This Plan is intended to comply with requirements of the federal Clean Air Act, as amended in 1990, and with relevant procedures and policies of the U.S. Environmental Protection Agency (EPA).

Ozone in the lower atmosphere is an air pollutant which is harmful to humans because it causes respiratory problems. Ozone also harms vegetation, reduces crop yields, and accelerates deterioration of paints, finishes, rubber products, plastics, and fabrics. The EPA has set primary national ambient air quality standards (NAAQS) for ozone and other [1] air pollutants to define the levels considered safe for human health. The NAAQS for ozone is set at 0.12 parts per million (ppm) for a one-hour averaging time. EPA procedures for determining attainment of the standard require representative air quality measurements showing three years of clean air, with no more than one exceedance of the standard per year, on average, at any air monitoring site.

The Bay Area Air Quality Management District (BAAQMD or District) was established in 1955 by the California Legislature to control air pollution in the counties around San Francisco Bay.[2] The BAAQMD has measured ozone levels for many years and now has 23 monitoring sites with certified instruments measuring ozone. Because past ozone measurements showed violations of the national standard, the Bay Area was designated by EPA as a nonattainment area, and was subject to various planning and air pollution control requirements.

Many federal, State and regional control programs have been implemented over the years to reduce ozone levels. BAAQMD air monitoring records for the past three years (1990, 1991 and 1992) show ozone levels low enough to qualify the region for attainment status with respect to the national standard.[3] This document is part of the formal procedure by which the Bay Area regional planning agencies[4] request redesignation to attainment status and demonstrate that ozone will not increase to a level above the federal standard in the future.

This Maintenance Plan will be adopted by the three regional agencies and submitted to the California Air Resources Board (ARB) for subsequent transmittal to EPA by November 15, 1993.

Because the San Francisco Bay Area has not yet been redesignated to attainment status for the national ozone standard, the 1990 Clean Air Act Amendments require that the three regional agencies prepare a Non-Attainment Area and Rate of Progress Plan (Attainment Plan). This plan must be submitted to the EPA via the ARB by November 15, 1993. However, if EPA approves the Maintenance Plan, the Attainment Plan will be withdrawn.

1 Carbon monoxide, particulate matter, sulfur dioxide, nitrogen dioxide and lead are other pollutants for which NAAQS have been established.

2 Counties in the San Francisco Bay Area Air Basin include all of Alameda, Contra Costa, Marin, Napa, San Francisco, San Mateo and Santa Clara counties, and the western part of Solano and the southern part of Sonoma counties.

3 California's standard for ozone is 0.09 parts per million, for a one-hour average. There is a separate State air quality planning process outlined in the 1988 California Clean Air Act and subsequent amendments.

4 The regional planning agencies (the BAAQMD, the Association of Bay Area Governments and the Metropolitan Transportation Commission) have been designated co-lead agencies for federal air quality planning in the San Francisco Bay Area.

SECTION 2:
NATIONAL AMBIENT AIR QUALITY STANDARD FOR OZONE

This Maintenance Plan addresses the ambient air quality standard for ozone set by EPA, under the provisions of the Clean Air Act of 1967 and subsequent amendments.

The harmful effects of air pollution have been recognized for many years, but scientific studies and legal procedures have been developed only in recent decades to define specific pollutants. Ozone is the principal component of photochemical smog. It was first recognized and studied by Haagen-Smit in Southern California in the early 1950s. Beginning in 1969, the State of California set a photochemical oxidant standard, and in 1971 the EPA set national ambient air quality standards for several air pollutants, including photochemical oxidants. In 1979, EPA changed the photochemical oxidant standard to an ozone standard. The current national standard, the subject of this Plan [5], is 0.12 parts per million of ozone in ambient air, based on a one-hour averaging time for the measurement. This is usually shortened to 0.12 parts per million, or simply 0.12 ppm.

There are both primary and secondary air quality standards. Primary standards are set to protect human health, with a margin of safety to protect the more sensitive persons in the population such as the very young, the elderly, and the ill. Secondary standards are set to protect property, materials, aesthetic values and general welfare. Primary and secondary standards for a pollutant may be set at the same or different levels. For ozone, the national primary and secondary standards are identical. The numerical levels of the standards are subject to change, based on new scientific evidence (or new interpretation of existing evidence) summarized in air quality criteria documents. The criteria and the standards are periodically reviewed, but changes are infrequent. The national primary and secondary standards for ozone have been set at 0.12 ppm since 1979.

Ozone is a reactive chemical compound--a molecule consisting of three oxygen atoms with the chemical symbol O_3. Ozone is a strong oxidizing agent with a potential to damage living or inanimate things with which it comes in contact. When present in the lower atmosphere [6], even at low concentrations, ozone is harmful to human health and to property. Ozone damages trees and other natural vegetation, reduces agricultural productivity, and causes or accelerates deterioration of building materials, surface coatings, rubber, plastic products and textiles. The most common human health effects are breathing impairment. These are thought to be reversible acute effects, but there is some emerging evidence of chronic effects from long-term exposure.

The formal statement of the national ozone standard appears in the Code of Federal Regulations (CFR 40 Part 50.9), which says:

> *The standard is attained when the expected number of days per calendar year with maximum hourly average concentrations above 0.12 part per million (235 ug/m^3) is equal to or less than one, as determined by Appendix H.*

Appendix H to Part 50 provides an interpretation of the standard and a procedure for estimating the number of exceedances per year. Other EPA guidance documents provide detailed procedures for evaluating air monitoring data and determining attainment of the national standard.[7]

In general, showing "attainment" requires collecting representative air monitoring data using approved measuring instruments and procedures, with adeqate quality assurance and quality control. The three most recent calendar years' measurements are examined with special attention to any hourly measurements higher than the standard. All locations within an area have to meet the standard, so a determination is made for each monitoring site. The average annual number of exceedances must be less than or equal to one. In practice, no monitor can have more than three days with exceedances of 0.12 ppm during the three most recent calendar-years.

5 The current California standard for ozone is 0.09 ppm, based on the State's independent interpretation of medical and scientific evidence. The BAAQMD has prepared and adopted the *1991 Clean Air Plan* to reduce ozone levels and maintain progress toward attainment of the more stringent State standard. That effort is independent of this Maintenance Plan for the national ozone standard.

6 This Plan addresses ozone in the lower atmosphere, near the ground where people breathe and where ozone affects plants and property. A separate layer of ozone in the stratosphere, miles above the earth's surface, absorbs ultraviolet radiation and is generally thought to be beneficial to human health and welfare. Stratospheric ozone will not be affected by this Plan.

7 Laxton, W. G., June 18, 1990, and J. Calcagni, September 4, 1992.

Air quality measurements in the Bay Area satisfy these requirements, as shown in Section 3, "Attainment Demonstration, Ambient Air Quality Monitoring Data -- 1990 - 1992."

SECTION 3: ATTAINMENT DEMONSTRATION

Ambient Air Quality Monitoring Data -- 1990-1992

Monitoring Network

The Bay Area has a comprehensive network consisting of 23 stations for ozone monitoring. In federal regulations, the network is referred to as the "SLAMS" system, where SLAMS is an acronym for State and Local Air Monitoring Stations. Ambient Air Quality Surveillance is covered in Part 58 of Volume 40 of the Code of Federal Regulations.

The BAAQMD began ozone monitoring in a few places in 1959, and ozone levels as high as 0.34 ppm were measured in San Jose in the 1960s. A large, modern ozone network was established in 1965. Significant improvements have been made over the years in instrumentation, area coverage, quality assurance, and data processing procedures. The EPA provided funding for some of these improvements. The present network provides good geographical coverage and includes source areas, populated areas, and downwind high concentration areas. The monitors are carefully maintained and operated, with adequate quality assurance procedures. The system has scored well on audits conducted by the EPA and ARB. A map of the network is provided in Appendix A, "Air Monitoring Network," along with a list of stations, addresses, monitoring objectives, and scales of representativeness. Appendix B, "Historical Ozone Trends / Air Monitoring Data," provides a discussion of historical ozone trends from the mid-1960s to the present.

Ozone monitors run continuously, and hourly averages are derived electronically via data loggers and integrators. After review and quality assurance procedures are completed, the SLAMS data are reported from BAAQMD to ARB and thence to the national ambient air monitoring data network that is part of "AIRS," the Air Information Retrieval System maintained by EPA. Attainment/nonattainment status and nonattainment classifications are based on data in the AIRS data base.

Recent Ozone Monitoring Trends

Table 1 presents information on daily maximum ozone concentrations in the Bay Area for 1990, 1991 and 1992. Shown for each monitoring site are the numbers of days exceeding the national ozone standard and maximum and second highest hourly ozone values. From 1990 through 1992, no District monitor registered more than two exceedances of the national ozone standard. More detail on the air monitoring data is provided in Appendix B, "Historical Ozone Trends."

The national standard allows up to three expected[8] exceedances at any one site over a three-year period (i.e., less than or equal to an average of one exceedance per year). Because of a forced relocation, the new Alum Rock site did not have a complete three years of monitoring data to determine the number of exceedances. Based on the monitoring data, and the calculated number of expected exceedances at the Alum Rock monitoring station, the BAAQMD contends it has met the national ozone standard. Supporting evidence for this claim is provided in Appendix C, "Estimated Exceedances at Alum Rock." **In the "attainment" years (1990, 1991 and 1992), no single monitor had four or more exceedances of the national ozone standard.**

The two locations where exceedances of the national standard were last recorded are of particular interest in terms of their geographic distribution, and the format of the national standard, which defines attainment statistically as no more than three days exceeding the standard in the most recent three years at any single station. By this EPA definition, the District in 1992 had attained the national ozone standard. Livermore, the last station to exceed this standard, had an expected annual exceedance of 0.67, which is less than one day per year.

8 The statistical term "expected" is used to allow for computational corrections in the monitoring data arising from missing values or incomplete sampling.

TABLE 1

San Francisco Bay Area
State and Local Air Monitoring Stations
(SLAMS) Ambient Ozone Measurements
Exceedances of the National Standard and Peak Hourly Concentrations
1990-1992

Site	Number of Exceedances of the National Ozone Standard				Peak Daily High Ozone (ppm**)	
	1990	1991	1992	1990-92	Maximum	SecondHigh
North Counties						
Santa Rosa	0	0	0	0	0.09	0.08
Sonoma	0	0	0	0	0.10	0.10
Napa	0	0	0	0	0.11	0.11
Vallejo	0	0	0	0	0.11	0.11
Fairfield	0	0	0	0	0.10	0.10
Central Bay						
San Francisco	0	0	0	0	0.08	0.06
San Rafael	0	0	0	0	0.08	0.07
Richmond	0	0	0	0	0.08	0.06
Oakland	0	0	0	0	0.08	0.07
San Leandro	0	0	0	0	0.12	0.11
Peninsula						
Redwood City	0	0	0	0	0.09	0.08
Mountain View	0	0	0	0	0.12	0.11
East Contra Costa						
Concord	0	0	0	0	0.11	0.11
Pittsburg	0	0	0	0	0.11	0.11
Bethel Island	0	0	0	0	0.12	0.12
So. Alameda County						
Fremont	1	0	0	1	0.13	0.12
Hayward	0	0	1	1	0.13	0.10
Livermore	1	1	0	2	0.14	0.13
Santa Clara Valley						
San Jose-4th Street	0	0	0	0	0.12	0.12
San Jose-San Carlos Street	1	0	0	1	0.13	0.11
Los Gatos	0	0	1	1	0.12	0.12
Alum Rock (old)	0	-	-	0	0.11	0.09
Alum Rock(new)	(1*)	0*	1	2	0.13	0.11
Gilroy	0	1	0	1	0.13	0.12

* For the new Alum Rock site, number of exceedances for 1990 and 1991 are estimated. Maximum and second high are the peak values observed in 1992.

** Value must exceed 0.12 ppm to be considered an exceedance of the national ozone standard.

Permanent and Enforceable Improvement in Air Quality

EPA guidance (Calcagni, September 4, 1992) says that the State must be able to reasonably attribute the improvement in air quality to emission reductions which are permanent and enforceable. Economic downturns and/or unusual meteorology are cited as factors which might result in lower ozone concentrations and an attainment record that is "artificial." That is, the attainment might not be sustainable through a return to "normal" economic conditions and meteorology.

Economic Effects

Trend data were compiled for vehicle miles traveled (VMT) and employment as viable surrogates for the overall level of economic activity in the nine Bay Area counties (Tables 2 and 3). This geographic area corresponds closely to the Bay Area Air Basin, with the exception of northern Sonoma and eastern Solano counties, which are included in the economic data but are outside the District.

Because motor vehicles produce about half of the man-made ozone precursors [9], VMT is a very good representation of the effects of economic conditions on mobile source emissions. Bay Area employment is a good indicator of commercial and industrial activities, which also affect the rate of pollutant emissions. Table 2 shows VMT estimates for the Bay Area, and Table 3 shows employment statistics for the years 1981 through 2005. (1993 and later data are, of course, projections for the future.)

The VMT data show plateaus for 1991 and 1992, lower than the historical rates of increase. Travel did not actually decrease, but it did not increase as much as expected. Therefore travel-related emissions did not actually decrease due to economic conditions, and were not likely to have affected our attainment of the national ozone standard.

Significant increases in VMT are not expected until 1995, at which time a two percent annual increase is expected. By 1994, the emissions inventory will have declined to a level where an exceedance of the national ozone standard is highly unlikely.

Vehicle miles traveled, an important input to the emissions inventory (see Section 5, "Maintenance Demonstration"), is estimated by both Caltrans (the State Department of Transportation) and by the Metropolitan Transportation Commission (MTC) (the regional transportation planning agency). Cal-

TABLE 2

San Francisco Bay Area
Vehicle Miles Traveled (VMT)
(Millions, State and Non-State Highways)

Year	Daily VMT	Annual Growth
1982	77.8	Baseline
1983	82.3	5.78%
1984	88.9	8.02%
1985	94.8	6.64%
1986	100.1	5.59%
1987	102.9	2.80%
1988	106.0	3.01%
1989	107.7	1.60%
1990	108.6	0.84%
1991	108.6	0.00%
1992	109.1	0.46%
1993	112.6	3.21%
1994	111.2	-1.24%
1995	114.9	3.33%
1996	120.0	4.44%
1997	122.6	2.17%
1998	125.2	2.12%
1999	127.9	2.16%
2000	130.6	2.11%
2001	133.3	2.07%
2002	136.1	2.10%
2003	138.9	2.06%
2004	141.8	2.09%
2005	144.7	2.05%
Pre-Attainment	(1982-1989)	5.49%
Since Attainment	(1990-1992)	0.43%
Forecast	(1993-2005)	2.19%

Sources:

Assembly of Statistical Reports, Caltrans Div. of Highways Office of Federal Reporting and Analysis;

Luk Lee, Caltrans Office of Traffic Improvement Statewide Travel Analysis Branch (916) 445-6958;

Personal Conversation between Amir Fanai, BAAQMD, and Charles L. Purvis, MTC, April 8, 1993.

9 Significant ozone precursors include organic compounds (hydrocarbons) and oxides of nitrogen which are produced by gasoline combustion. Organic compounds react with oxides of nitrogen in the presence of sunlight to produce photochemical smog, or ozone.

TABLE 3

San Francisco Bay Area Employment (Annual Average, in Thousands)

Year	Number	Annual Growth
1981	2483.9	Baseline
1982	2467.3	-0.67%
1983	2507.2	1.62%
1984	2653.3	5.83%
1985	2717.4	2.42%
1986	2733.2	0.58%
1987	2800.4	2.46%
1988	2885.7	3.05%
1989	2962.7	2.67%
1990	3019.9	1.93%
1991	2966.5	-1.77%
1992	2918.3	-1.62%
1993	2942.3	0.82%
1994	2923.3	-0.65%
1995	2975.0	1.77%
1996	3070.8	3.22%
1997	3136.1	2.13%
1998	3202.7	2.13%
1999	3270.8	2.13%
2000	3340.1	2.12%
2001	3408.9	2.06%
2002	3479.1	2.06%
2003	3550.8	2.06%
2004	3623.9	2.06%
2005	3698.3	2.05%
Pre-Attainment	(1981-1989)	2.41%
Since Attainment	(1990-1992)	-0.50%
Forecast	(1993-2005)	2.06%

Source:

Ray Brady, ABAG, April 1993

trans bases its VMT estimates on traffic volume count data at permanent monitoring stations and data reported by city and county public works departments for the Highway Performance Monitoring System (HPMS). MTC projects regional VMT using a travel demand model which is augmented by "off model" estimates for certain specific types of travel. The most recent MTC travel demand modelling (incorporating 1990 census data) provides VMT estimates for years 1987, 1990, 1996 and 2005 (the horizon year for this Maintenance Plan). Estimates of VMT for 1982 through 1992 were made by holding the MTC VMT estimate for 1987 and 1990 constant, and applying the annual percentage changes in HPMS data for years 1982 through 1992. The BAAQMD used regional employment projections from the Association of Bay Area Governments (ABAG) to interpolate annual VMT for 1993 through 2004, holding the MTC VMT estimate for 1996 and 2005 constant.

Wage and salary employment was chosen as an indicator of stationary source emissions. Employment figures did show modest decreases (1.6 - 1.8%) for the years 1991 and 1992. We might presume that the stationary source emissions also decreased by the same amounts as wage and salary employment figures. The overall effect on the stationary source inventory should have been less than a 2% reduction, not enough to significantly effect the Bay Area's attainment of the national ozone standard.

Employment is projected to remain about the same through 1994 and begin to increase again in 1995. The 1990 employment level (the first year of three consecutive years used in demonstrating attainment) will likely not be reached until 1996.

Effects of Weather

Table 4 shows the meteorological situation, with respect to ozone formation, for the 1990-92 attainment window. Ozone formation is highly correlated with high temperature days in the summer. Downtown San Jose[10] maximum temperatures were

TABLE 4

Comparison of 1990-92 San Jose High Temperatures with Long-term Average San Jose-High Temperatures (degrees Fahrenheit)

	90-92 mean	30-year mean	Difference
maximum	98.7	99.4	(0.7)
2nd highest	96.7	97.6	(0.9)
3rd highest	95.7	96.7	(1.0)
4th highest	95.0	95.6	(0.6)
5th highest	94.0	94.8	(0.8)
6th highest	93.0	94.3	(1.3)
7th highest	92.7	93.7	(1.0)
8th highest	92.3	93.1	(0.8)
9th highest	92.0	92.5	(0.5)
10th highest	91.3	92.1	(0.8)

10 Downtown San Jose temperatures were taken at a station operated by the U. S. Department of Commerce, National Weather Service.

used because there is a reliable long-term record, and because downtown San Jose maximum temperature has proven to be a good ozone predictor in the past. Table 4 compares the mean (average) high temperatures in the 1990-92 period with 30-year mean high temperatures (in degrees Fahrenheit). The first row of data represents the mean of the annual maximum temperatures, the second row contains the mean of the second highest temperatures for each year, and so on. The third column, containing the differences between 1990-92 temperatures and the long-term mean, shows that the high temperatures in the 1990-92 period were slightly lower than usual, but by less than two degrees. There were many days in the 1990-92 period with temperatures above 90° F, and therefore many opportunities for exceedances of the national ozone standard. The monitoring data, however, show attainment of the standard.

Permanent and Enforceable Emissions Reductions

The 1982 Air Quality Plan for the Bay Area projected attainment of the national ambient air quality standard for ozone by 1987, if the Plan control measures were implemented. Because motor vehicle inspection and maintenance (I & M) program benefits were less than expected, and there were some delays or discrepancies in other measures, the standard was not attained in 1987. The 1987 Reasonable Further Progress (RFP) Report for the Bay Area showed that there was a 43 ton per day shortfall from the attainment target. This shortfall is equivalent to 54 tons per day in 1990. However, by 1990, essentially all of the 1982 Plan measures had been adopted, improvements to the I & M program had come into effect, and other control measures had been adopted. Table 5 lists a number of control measures that resulted in significant emission reductions between 1987 and 1990 (totaling 70.5 tons/day of reactive organics). The actual change in the reactive organic inventory between 1987 and 1990 was a reduction of 66 tons/day (see Table 6 in Maintenance Demonstration section). This level reflects growth in emissions from some sources as well as the reduction in emissions due to all control measures. The net effect is that the control measures in Table 5 and other measures reduced emissions below the projected attainment level.

TABLE 5
Reactive Organics Emission Reductions from Selected Control Measures* Between 1987 and 1990

Control Measures*	BAAQMD Reg 8 Rule #	Emission Reductions (tons/day)
Stationary Sources		
Architectural Coatings	3	1.6
Emulsified and Liquid Asphalts	15	1.6
Solvent Cleaning Operations	16	0.8
Valve and Flanges at Petroleum Refinery Complexes	18	1.5
Graphic Arts Printing and Coating Operations	20	0.6
Pump and Compressor Seals at Petroleum Refineries	25	0.9
Solid Waste Disposal Sites	34	4.2
Natural Gas and Crude Oil Production Facilities	37	0.5
Motor Vehicle and Mobile Equipment Coating Operations	45	0.5
Marine Tank Vessel to Marine Tank Vessel Loading	46	0.5
Aerosol Paint Coatings	49	0.8
Stationary Source Subtotal		13.5
Mobile Sources		
ARB Motor Vehicle Program (including Basic I & M)	n/a	57.0
TOTAL		70.5

* Control measures achieving at least 0.5 tons per day reduction of reactive organic emissions between 1987 and 1990.

SECTION 4:
REDESIGNATION REQUEST

The three designated co-lead regional planning agencies--ABAG, BAAQMD and MTC--request that EPA redesignate the San Francisco Bay Area to attainment status with respect to the national ambient air quality standard for ozone. This Redesignation Request and Maintenance Plan addresses the criteria presented in Section 107(d)(3)(E) of the Clean Air Act:

(1) Verification that the National Ambient Air Quality Standards (NAAQS) have been attained.

Attainment of the NAAQS in the Bay Area is discussed in Section 3 of this document, "Attainment Demonstration - Ambient Air Quality Monitoring Data -- 1990-1992."

(2) State Implementation Plan fully approved by EPA under Section 110(k).

The *1982 Bay Area Air Quality Plan* (AQP), the SIP for the Bay Area, and its compliance with Section 110(k) of the CAA is addressed in Section 7 of this document, "Administrative Requirements, Approved SIP."

(3) Improvements in air quality from permanent and enforceable reductions in emissions.

The improvements in air quality in the Bay Area are due to permanent and enforceable reductions in emissions as discussed in Section 3 of this document, "Permanent and Enforceable Improvement in Air Quality."

(4) All applicable requirements have been met as defined in Section 110 and Part D of the CAA.

Compliance with Section 110, Part D, Section 172(c) and Section 176(c)(4) of the CAA is discussed in Section 7 of this document, "Administrative Requirements," within the subsections "Previous/Existing SIP Requirements" and "Conformity Requirements."

(5) EPA has fully approved a maintenance plan, including a contingency plan, as defined in Section 175 of the CAA.

The five elements of a maintenance plan required under the CAA are provided in the sections of this document as indicated below:

Required Element	Section of this Plan
Attainment Inventory	Sect. 5: Maintenance Demonstration
Maintenance Demonstration	Sect. 5: Maintenance Demonstration
Monitoring Network	Sect. 7: Administrative Requirements
Verification of Continued Attainment	Sect. 7: Administrative Requirements
Contingency Plan	Sect. 6: Contingency Measures

SECTION 5:
MAINTENANCE DEMONSTRATION

Attainment Inventory and Inventory Projections

An emission inventory is an itemized list of emission estimates for sources of air pollution in a given area for a specified time period. Present and future year inventories are critical components of air quality planning and modeling. The ultimate goal of the planning process is to identify and achieve an emission pattern which does not result in violation of ambient standards.

The BAAQMD's emission inventory is divided into stationary sources (e.g., refineries) and mobile sources (e.g., cars). Stationary sources are further subdivided into **point** (e.g., "smokestack"), **area** (e.g., use of consumer products and very small point sources) and **biogenic** (i.e., from the earth and its natural geological and biological sources) emissions. The actual 1987-2005 Bay Area reactive organics and nitrogen oxides emissions are summarized in Table 6 and Figures 1 and 2. The emissions are in tons per ozone season day. The preparation of the 1990 inventory is described in Appendix D, "Emission Inventory." The current emissions in the BAAQMD's bank are added to the total inventory, because they could be withdrawn and applied toward expansion of stationary sources.

The attainment time window, when air monitoring results showed attainment of the standard, was 1990 through 1992. The attainment inventory must have been reached, therefore, in 1990. Table 6 shows reactive organic emissions were 629 tons per day in 1990. Additional details on the inventory are provided in Appendix D.

Table 6

Bay Area Baseline* Emission Inventory Projections: 1987 - 2005, Planning Inventory (Tons/Day)**

	Reactive Organics[1]					Oxides of Nitrogen[2]				
Base Year 1990	1987	1990	1995	2000	2005	1987	1990	1995	2000	2005
Industrial/Commercial Processes/Facilities										
Petroleum Refining Facilities	21	19	16	16	16	11	11	12	12	12
Chemical Manufacturing Facilities	3	4	4	4	4	3	3	3	3	3
Other Industrial/Commercial Processes/Facilities	21	22	22	21	18	–	–	–	–	1
Petroleum Product/Solvent Evaporation										+
Petroleum Refinery Evaporation	10	10	8	8	8	–	–	–	–	–
Fuels Distribution	23	24	23	24	25	–	–	–	–	–
Other Organic Compound Evaporation	126	119	106	103	105	–	–	–	–	–
Combustion - Stationary Sources										+
Fuel Combustion	8	7	8	8	9	160	132	132	145	154
Burning of Waste Material	1	1	1	1	1	2	2	2	2	2
Banking	6	6	6	6	6	6	6	6	6	6
Subtotal (District Jurisdiction)	219	212	194	191	192	183	155	156	169	179
Combustion - Mobile Sources										
On-Road Motor Vehicles[3]	356	299	204	142	104	283	251	194	166	158
Off-Highway Mobile Sources	62	66	69	66	67	137	144	147	157	166
Aircraft	16	16	17	18	19	15	16	17	18	19
Consumer Solvents and Other Sources	76	70	65	67	70	–	–	–	–	–
Grand Total	729	663	549	484	452	618	566	514	510	522

* Baseline projections are made assuming implementation of all control programs already adopted at federal, state, and regional levels as of December 31, 1992.,

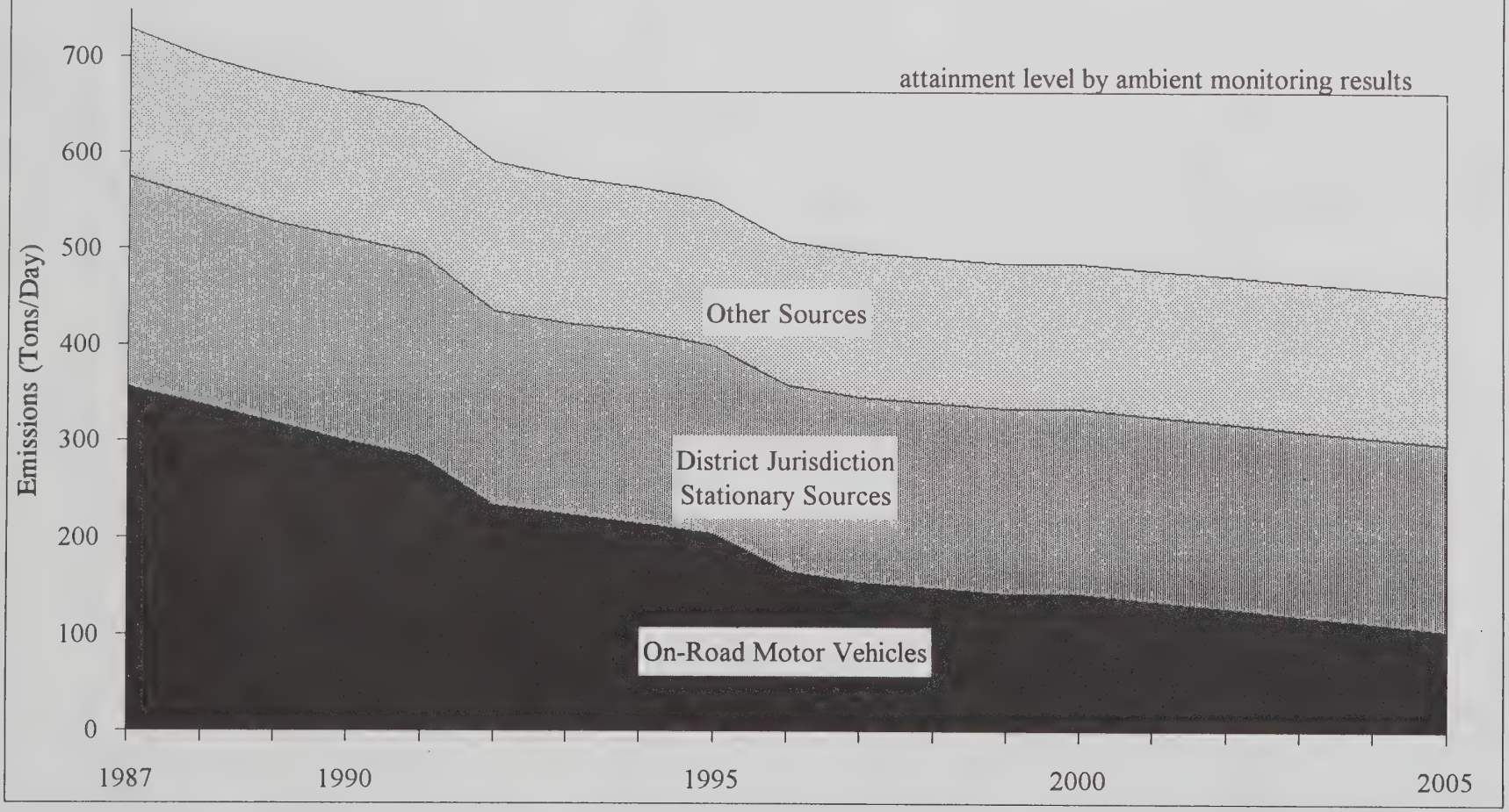
** Anthropogenic, or man-made, ozone precursors for summer operating day (does not include about 300 tons/day reactive organics from natural sources).

[1] Reactive organics (photochemically reactive organic compounds)

[2] Oxides of nitrogen (nitric oxide and/or nitrogen dioxide)

[3] Based on ARB's 'Draft' EMFAC7F emission factors and draft BURDEN7F with MTC travel data.,

Figure 1 - Bay Area Emission Inventory Projections 1987 - 2005
Reactive Organics Emissions



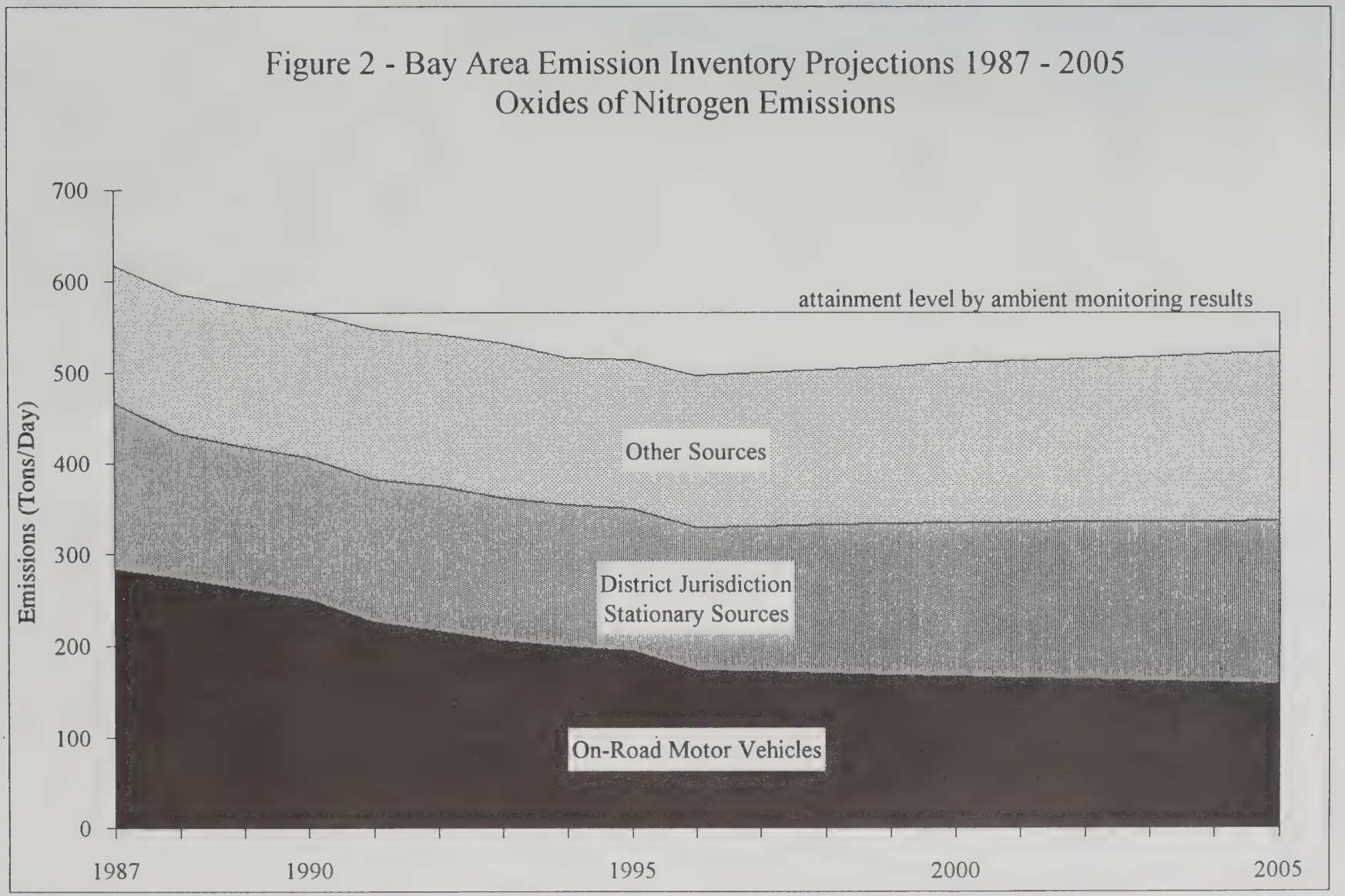


Figure 2 - Bay Area Emission Inventory Projections 1987 - 2005
Oxides of Nitrogen Emissions
Emissions (Tons/Day)
700
600
500
400
300
200
100
0
1987
1990
1995
2000
2005
attainment level by ambient monitoring results
Other Sources
District Jurisdiction Stationary Sources
On-Road Motor Vehicles

SECTION 6:
CONTINGENCY MEASURES

Section 175A(d) of the 1990 CAAA requires that a maintenance plan include contingency provisions. These provisions would be implemented in the event that violations of the NAAQS occurred after redesignation to attainment. The specific contingency measure identified to meet this requirement is an "enhanced" inspection and maintenance (I&M) program for motor vehicles.

Section 182(c)(3) of the 1990 CAAA requires an "enhanced" I&M program in areas classified as having "serious," "severe" or "extreme" air quality problems. "Moderate" areas are required to have a "basic" I&M program.

The Bay Area which is classified as "moderate" for ozone, would only be required to implement the "basic" I&M program, which is in place today. The basic I&M program includes an idle test and visual inspection for tampering and defects to the emission control systems. In addition, the basic I&M program allows test and repairs to occur at the same location, with cost limits ranging from $75 to $300, depending on the model year. The present program would require only minor changes to meet EPA's "basic" program requirements.

Under EPA's guidelines, the enhanced I&M program would improve the testing of automobiles for emissions under loaded modes, during acceleration, and from evaporation. The program would separate State-contracted test stations from the repair stations and increase the repair cost limits to at least $450.

In California, I&M programs are adopted by the State Legislature. The three regional agencies anticipate that the State Legislature will adopt a complying enhanced I&M program and that the Bay Area will elect to implement the program as needed to attain State air quality standards and/or as a contingency measure to maintain national standards. Table 7 shows the potential emission reductions from this measure as the difference between the enhanced program and the basic program.

TABLE 7

EMISSION REDUCTIONS FROM IMPLEMENTATION OF AN ENHANCED I&M PROGRAM IN THE BAY AREA (Tons/day)

Pollutant	Basic I&M	Enhanced I&M	Difference
ROG	28	52	24
CO	235	537	302
NO_x	12	41	29

Source: California I/M Review Committee's *Fourth Report to the Legislature--Evaluation of the California Smog Check Program and Recommendations for Program Improvements*, February 16, 1993.

SECTION 7:
ADMINISTRATIVE REQUIREMENTS

Previous/Existing SIP Requirements

Compliance with the CAA SIP Planning Requirements

Based on the information presented below, the Bay Area has complied with State Implementation Plan (SIP) planning requirements specified in Section 110(k) of the CAA. The SIP, the document guiding the region toward attainment of the national ozone standard, is embodied in the *1982 Bay Area Air Quality Plan* and all subsequent revisions of the Plan, through the date of submittal of this document to EPA.

Approved SIP

The 1982 Plan

The EPA-approved SIP for the Bay Area is the *1982 Air Quality Plan.* The notice of final rulemaking, approving this plan, appeared in the *Federal Register* on December 28, 1983, and approved all portions of the 1982 Plan except the vehicle inspection and maintenance program elements, which were approved in 1984.

The stationary source control measures contained in the SIP are listed in Table 8. This table also lists the adoption dates of the control measures. The 12 original transportation control measures (TCM) contained in the 1982 Plan are listed in Table 9, along with 16 additional contingency TCMs adopted by MTC in February 1990. All of the TCMs are being implemented by the Metropolitan Transportation Commission in association with State and local agencies.

SIP Planning Between 1987 and the Present

The 1982 Plan responded to a requirement of the CAA for nonattainment areas to prepare plans showing attainment of the NAAQS by December 31, 1987. The CAA did not specify what post-1987 planning requirements existed for areas which did not attain the standards by 1987. In the interim, between the end of 1987 and the adoption of the Clean Air Act Amendments in November 1990, planning for attainment in nonattainment areas was guided by EPA requirements in the form of "SIP calls." These SIP calls constitute revisions in the SIP showing reasonable further progress (RFP) toward attaining the standards. For the Bay Area, SIP calls between the years 1987 and the present are contained in Table 10. In February 1990, MTC adopted 16 contingency TCMs shown in Table 9.

SIP Planning Requirements of the 1990 CAAA

The adoption of the 1990 CAAA established new SIP planning requirements. Although the region has attained the national ozone standard, the region is subject to two additional planning requirements until EPA approves this Maintenance Plan:

- A Non-Attainment Area Plan is required to demonstrate how the region will attain the national ozone standard by November 15, 1996. This Plan is due to EPA November 15, 1993, if the Empirical Kinetic Modeling Approach (EKMA) is used or by November 15, 1994, if the Urban Airshed Model (UAM) is used.
- A Rate-of-Progress Plan is due to EPA by November 15, 1993. The goal is to identify VOC reductions of at least 15% from baseline 1990 emissions, by November 15, 1996, excluding federal motor vehicle emissions controls in place in 1990.

The three regional agencies are preparing a joint Nonattainment Area and Rate-of-Progress Plan for submittal to ARB and transmittal to EPA. When the EPA formally approves this Maintenance Plan, the California Air Resources Board will withdraw the Nonattainment Area and Rate-of-Progress plan.

Conformity Process

Section 176(c) of the 1990 Clean Air Act amendments (CAAA) outlines the "conformity" provisions of the Act. Federal actions are required to conform to the State Implementation Plan's (SIP's) purpose of eliminating or reducing the severity and number of violations of the National Ambient Air Quality Standards and achieving expeditious attainment of these standards. Federal actions are differentiated into transportation-related actions by FHWA or FTA, and all other federal actions. The "transportation conformity" regulations govern the first set of actions, and the second set of actions will be addressed by the "general conformity" regulation to be issued later this year. This section provides a general overview of the transportation conformity requirements as conducted by MTC.

MTC will not approve any transportation plan, program, or project unless these activities conform to the purpose of the SIP. MTC's current conformity requirements include procedures from federal court orders relating to litigation over the 1982 Bay Area Air Quality Plan (the '82 SIP for the Bay Area) as well as procedures from the June 1991 Joint DOT/EPA "interim" guidance for transportation conformity.

Transportation plan refers to the MTC Regional Transportation Plan (RTP), which is the 20-year master plan for the region and which provides policies, actions, and financial projections to guide transportation investment decisions. Transportation program refers to the Transportation Improvement Program (TIP), which is a financially realistic set of

TABLE 8
1982 Plan Stationary Source Measures

Measure	BAAQMD (Reg. - Rule)	Adoption Date	Estimated Emission Reductions (tons/day)
1. Tanker Ballasting		1.	2.5
2. Reciprocating Engines		2.	4.0
3. Gasoline Distribution	(8-33)	01/09/85	1.0
4. Pesticides		3.	3.7
5. Wood Furniture Coatings	(8-32)	09/21/83	1.1
6. Organic Chemical Mfgr.	(8-9, 10, 22, 25, 28)	07/20/83	0.3
7. Aerospace	(8-29)	08/04/82	0.5
8. Consumer Solvents		4.	4.0
9. Coating of Plastic	(8-31)	09/07/83	2.0
10. Semiconductor	(8-30)	07/06/83	5.7
11. Industrial Maintenance Coating	(8-3, 48)	01/08/86	1.0
12. VOC Storage	(8-5)	09/04/85	3.0
13. Large Commercial Bakeries	(8-42)	09/20/89	1.1
14. Zero Gap Seals	(8-5)	09/04/85	1.5
15. Polymer & Resin	(8-36)	06/06/84	0.2
16. Rubber/Plastic	(8-5)	09/04/85	1.1
17. Coatings Manufacturing	(8-35)	05/02/84	0.2
18. Natural Gas & Crude Oil	(8-37)	03/20/85	1.6
19. Sanitary Landfills	(8-34)	05/02/84	7.2
20. Vegetable Oil Mfgr.	(8-41)	12/17/86	0.4
21. VOW Disposal		5.	6.0
22. Auto Refinishing	(8-45)	06/07/89	5.2
23. Letterpress/Offset Printing	(8-20)	12/04/85	3.0
Total			**56.3**

1. United States Coast Guard promulgated a rule (33 CFR, Parts 154-155, 157) effective June 1981.
2. Adopted by California Air Resources Board (ARB) March 20, 1992.
3. Adopted by California Department of Food and Agriculture, Article 2, Volatile Organic Compounds, Rule 6895, Prohibition of Use of Weed Oils, Operative 8/16/90.
4. Adopted by ARB, 10/11/90.
5. Requirements of State Hazardous Waste Control Law and Hazardous Waste Management Act of 1986 satisfy this control measure.

TABLE 9
Transportation Control Measures

Original Transportation Control Measures (TCMs) from 1982 Plan

TCM	1	Reaffirm commitment to 28% Transit Ridership Increase between 1978 and 1983.
TCM	2	Support post-1983 Improvements in the Operators' Five-Year Plans and, after consultation with the operators, adopt Ridership Increase Target for the period 1983 through 1987.
TCM	3	Seek to expand and improve public transit beyond committed levels.
TCM	4	High Occupancy Vehicle (HOV) lanes and ramp metering.
TCM	5	Support RIDES efforts.
TCM	6	Continue efforts to obtain funding to support Long-Range Transit Improvements.
TCM	7	Preferential parking.
TCM	8	Shared-use Park and Ride lots.
TCM	9	Expand commute alternatives program.
TCM	10	Information program for local governments.
TCM	11	Gasoline Conservation Awareness Program (GasCAP).
TCM	12	Santa Clara County Commuter Transportation Program.

Contingency Plan TCMs

TCM	13	Increase bridge tolls to $1.00 on all bridges.
TCM	14	Bay Bridge Surcharge of $1.00.
TCM	15	Increase state gas tax by 9 cents.
TCM	16	Implement MTC Resolution 1876, revised - New Rail Starts.
TCM	17	Continue post-earthquake transit services.
TCM	18	Sacramento-Bay Area Amtrak Service.
TCM	19	Upgrade CalTrain service.
TCM	20	Regional HOV system plan.
TCM	21	Regional transit coordination.
TCM	22	Expand regional transit connection ticket distribution.
TCM	23	Employer audits.
TCM	24	Expand signal timing program to new cities.
TCM	25	Maintain existing signal timing programs.
TCM	26	Incident management on Bay Area freeways.
TCM	27	Update MTC guidance on development of local TSM Programs.
TCM	28	Local TSM initiatives.

Source: FY 1992-96 Transportation Improvement Programs (TIP) for the nine-county San Francisco Bay Area, Volume 3, Air Quality Assessment, September 25, 1991, Metropolitan Transportation Commission.

TABLE 10
BAAQMD Rules Subject to 1988 SIP Call[1]

Rule No.	Name	Adopted by District in Response to SIP Call	Submitted to ARB by BAAQMD	Submitted to EPA by ARB
8-11	Can and Coil	09/20/89 03/07/90	12/18/89 03/28/90	12/31/90 12/31/90
8-12	Fabric Coating	06/21/89 09/20/89	12/18/89 12/18/89	No[2] 12/31/90
8-13	Auto/LDT Coating	09/20/89	12/18/89	12/31/90
8-14	Metal Furniture Coating	06/07/89	08/21/89	12/31/90
8-16	Degreasing	08/02/89	12/18/89	12/31/90
8-18	Refinery Fugitives	09/06/89	12/18/89	12/31/90
8-19	Misc Metal Parts Coating	06/07/89 02/03/93	08/21/89 No	12/31/90 No
8-20	Graphic Arts	04/19/89 09/20/89	05/16/89 05/16/89	03/26/90 12/31/90
8-22	Chemical Plant Fugitives	09/06/89	12/18/89	12/31/90
8-23	Flatwood Paneling Coating	06/21/89	Yes[3]	12/31/90
8-24	Manufacture of Pharmaceuticals	07/11/90	08/28/90	No
8-25	Refinery and Chemical Plant Fugitives	09/06/89	12/18/89	12/31/90
8-27	Perc. Dry Cleaning	09/05/90	12/28/90	No
8-28	Refinery and Chemical Plant Fugitives	09/06/89	12/18/89	12/31/90
8-29	Aerospace	11/01/89 02/03/93	01/31/90 No	12/31/90 No
8-31	Plastic Parts	06/07/89 02/03/93	08/21/89 No	12/31/90 No
8-32	Manufacture of Wood Furniture	04/17/91	Yes	05/13/91
8-37	Oil and Gas Production Fugitives	10/17/90	03/18/91	05/13/91
8-42	Bakeries	09/20/89	12/18/89	12/31/90
8-45	Auto Refinishing	06/07/89	09/13/89	12/31/90
8-50	Polyester/Resin Operations	12/05/90	Yes	05/13/91

1. BAAQMD rules identified (as of November 15, 1990) as being subject to 1988 SIP call.
2. "No" indicates the rule will be submitted prior to EPA's action on this Maintenance Plan.
3. "Yes" indicates the rule has been submitted; documentation of submittal date was not available.

Source: Letter to BAAQMD-APCO, Milton Feldstein, from U.S. EPA Air & Toxics Division Director, David P. Howekamp, dated March 8, 1991.

highway and transit projects to be funded over the next seven years; the TIP includes all projects requiring federal funding, permits, or other approvals. A transportation project is any highway or transit project which is included in the RTP and TIP, requires federal funding or action, and is submitted to MTC for project review and fund application approval. Detailed conformity criteria and procedures are described in MTC Resolution No. 2270 and are included in Appendix E, "Conformity Process."

On January 11, 1993, EPA published a Notice of Proposed Rule Making (NPRM) in the *Federal Register* which contained proposed "final" regulations for transportation conformity that will apply to both nonattainment and maintenance areas. The NPRM addresses two time periods: (1) the period up to the time when a revised SIP is approved by EPA, and (2) the period following the EPA SIP approval. Once these regulations are adopted, they will replace the 'interim" regulations mentioned above. However, until these regulations are adopted, the current set of federal court-ordered conformity procedures and interim DOT/EPA procedures will govern the transportation conformity process for the Bay Area.

Continued Air Monitoring and Verification of Continued Attainment

Continued Monitoring

The BAAQMD will continue to comply with Title III, Section 319, of the CAA requiring air quality monitoring. The District's monitoring stations are operated in compliance with EPA guidelines set forth in CFR 40 Part 58, "Ambient Air Quality Surveillance," and Appendices A through G of Part 58.

Verification of Continued Attainment

The BAAQMD will analyze annually the three most recent consecutive years to verify continued attainment of the national ozone standard, in accordance with CFR 40 Part 50, Appendix H. In accordance with Title III, Section 319, of the CAA requirements, as interpreted in CFR 40 Part 58.26, the District will continue to submit to the EPA an annual report by July 1 of each year for data collected from January 1 to December 31 of the previous year. This information, with the annual reports for the previous two years, will provide the necessary information for determining whether the region continues to attain the national ozone standard.

Environmental Review / California Environmental Quality Act (CEQA) Compliance

The Maintenance Plan would not be subject to CEQA review because the Plan does not require the BAAQMD, MTC or ABAG to adopt or implement new programs in the region that could have a significant effect on the environment. The Maintenance Plan simply relies on the continued implementation of regional planning and regulatory programs which have previously received environmental review under the Bay Area *1991 Clean Air Plan* (CAP) *Environmental Impact Report* (EIR). The CAP EIR addressed all the potential significant environmental impacts that might arise from the implementation of the CAP. The CAP, required under the California Clean Air Act, requires similar but more stringent regulatory action than those proposed as ongoing regulatory action under this Attainment Plan.

The enhanced Inspection and Maintenance (I & M) program proposed for incorporation into the Maintenance Plan as a contingency measure has not received environmental review. The I & M program would be promulgated by the California Legislature and adopted and implemented by the ARB or California Bureau of Automotive Repair (BAR). The ARB or BAR would be required under CEQA to provide environmental review and documentation of the enhanced I & M program prior to adoption of the program.

Transport

EPA Region IX has indicated that the Bay Area's Maintenance Plan should address transport of air pollutants to other regions. The movement of air pollutants, carried by the wind, across jurisdictional boundaries is called long-range transport, or simply transport.

Most violations of ambient air quality standards occur under stagnant weather conditions, when pollutant concentrations build up because emitted pollutants do not disperse either horizontally or vertically. For ozone, these conditions occur on hot, summer days, with calm air or very low wind speeds limiting horizontal dispersion, and temperature in-

versions in the atmosphere limiting vertical dispersion. Fortunately, these conditions occur on relatively few days each year in the Bay Area. The more common circumstance is the action of prevailing winds from the ocean, particularly during daylight hours. These winds sweep through the Golden Gate and other gaps in the coastal hills, then on through the Bay Area following the complex topography of the region. Winds carry air pollutants and precursors from the emission point to downwind locations, mixing with cleaner air or new emissions along the particular trajectory. Pollutant and precursor concentrations are much lower on windy days, because emissions are dispersed through larger volumes of ambient air.

There is general agreement that pollutant transport does occur between the various air districts and air basins of California. The wind direction, and the transport direction, may well change from day to day, depending on specific weather conditions. The ARB has identified various transport couples (source and receptor areas) around the State. The Bay Area is identified as both a source and a recipient of transported pollutants.

ARB is required by State law to evaluate intrastate transport and to suggest mitigation for such transport. A recent draft ARB staff report,[11] addressing California Clean Air Act requirements and the State ozone standard, suggests that the Bay Area is responsible for "overwhelming" transport to three locations in adjacent air basins. This assessment is based on specific days with certain meteorological conditions. The three locations are Vacaville (in the broader Sacramento area), Crows Landing (in the San Joaquin Valley) and Pinnacles National Monument (in the North Central Coast area). Monitoring data for Vacaville, Crows Landing, and Pinnacles National Monument indicate that each of these receptor locations attain the national ozone standard. Data in the ARB report indicate that no exceedances of the national ozone standard result from transport from the Bay Area. Therefore, the Bay Area does not cause violations of the national ozone standard in these areas and would not be subject to transport requirements in the context of federal air quality planning.

The Appendices referenced herein are not included with this document. They are included in a separate document, "Maintenance Plan Appendices", which can be obtained by calling the Bay Area Air Quality Management District, (415) 749-4900.

11 ARB, *Assessment and Mitigation of the Impacts of Transported Pollutants on Ozone Concentrations in California*, June 1993.